

A REVISION OF THE TROPICAL AMERICAN SPECIES OF *AMPHIPHOLIS* (ECHINODERMATA: OPHIUROIDEA)¹

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ABSTRACT

Studies of the tropical American species of the amphiurid brittlestar genus *Amphipholis* show that there are three species groups within the genus. *Amphipholis* is considered monotypic in tropical American waters and two new genera are described.

INTRODUCTION

Ljungman (1867a: 165) established the amphiurid brittlestar genus *Amphipholis* with a single species, *Amphipholis januarii*, from Rio de Janeiro. A few months later (Ljungman, 1867b: 311-315) he added 23 species, including *Amphipholis atra* (Stimpson) and *Amphipholis gracillima* (Stimpson). In 1871 (:644) he produced a key to the species of *Amphipholis* and increased their number to 27; however, he ignored Lyman's genera *Ophiophragmus* and *Ophiocnida*, and included nominal members of these genera in *Amphipholis*.

Lyman (1882: 146) considered *Amphipholis januarii* a synonym of *A. gracillima* (Stimpson), but gave no reason for so doing. Verrill (1899: 306) provided a diagnosis of *Amphipholis*, and listed the type-species as "*A. squamata* (or *A. elegans*)"; five pages later he cited the type species as *A. januarii* Ljungman, but, in an apparent lapse of memory, omitted *A. januarii* from a list of West Indian (including Brazil) species on the following page. Finally, in the same paper (:376), he listed *Amphipholis januarii* Ljungman as a synonym of *A. gracillima* (Stimpson). Fell (1962: 1) refers to "*Amphiura squamata* D. Chiaje" as "the type" of *Amphipholis*, but later (:13), he lists *Ophiolepis gracillima* Stimpson as the type-species. Despite the complexity of the problem, specialists have long considered *Amphipholis gracillima* (Stimpson) a synonym of *A. januarii* and therefore the type-species of *Amphipholis*.

The author recently found that the syntype of *Amphipholis januarii* in the collection of the Museum of Comparative Zoology at Harvard is not conspecific with *A. gracillima* but in fact is an example of the species which H. L. Clark (1918) described as *Amphipholis pachyactra*. Subsequent examination of the syntypes of *A. januarii* in the Stockholm Museum reveal that, of the 13 oral frames, 1 detached disc, and numerous arm fragments comprising the type lot, 5 oral frames represent specimens of *Amphipholis pachyactra* H. L. Clark, 5 are specimens of *Amphipholis*

¹Contribution No. 722 from the Institute of Marine Science, University of Miami.

subtilis Ljungman, and 3 are *Amphiodia pulchella* (Lyman). The disc is of uncertain origin but probably belongs to a specimen of *Amphipholis pachyactra*, and one fragment of an arm clearly came from a specimen of *Amphiura kinbergi* Ljungman (redescribed by Thomas, 1965). Ljungman (1867a) described *Amphipholis januarii* as having four somewhat coarse arm spines, and this qualification excludes all but the five specimens of the species which H. L. Clark (1918) named *Amphipholis pachyactra*. Because *A. pachyactra* was not described until 1918, it becomes a junior synonym of *Amphipholis januarii*, the type species of *Amphipholis*. Accordingly, one of the five specimens of *A. pachyactra* among the syntypes of *A. januarii* at the Stockholm Museum has been designated as the lectotype, and the other four have been designated paralectotypes.

Further study of *Amphipholis*, dictated by the change of type-species designation, has revealed that the genus is composed of several distinct species-groups, each warranting generic rank. These groups are considered in detail below.

The author wishes to thank Roy Oleröd, of the Stockholm Museum, H. Barraclough Fell and Elisabeth Deichmann of the Museum of Comparative Zoology at Harvard, and Fred Ziesenhenné, of the Allan Hancock Foundation, for their valuable assistance during the course of this study. He also wishes to acknowledge, with gratitude, the National Science Foundation for their support under grant G-23649.

This paper is part of a monographic revision (in preparation) of the amphiuroid brittlestars of the western Atlantic. The full monograph will be published later, but the present observations seem of such importance as to warrant prior publication.

THE *Amphipholis* COMPLEX

The author has long been dubious about the relationships of some supposedly congeneric amphiuroids. Recently he discovered pronounced similarities between *Amphiodia atra* (Stimpson) (Verrill [1899: 313] removed *A. atra* from *Amphipholis* and placed it in *Amphiodia* where it has been retained by subsequent authors) and *Amphipholis gracillima* (Stimpson). Both species have small, imbricated disc scales; slender, acutely pointed arm spines; wide distalmost oral papillae; ventral arm plates which are wider at their proximal ends than at their distal ends; and a wide innermost tentacle scale which extends to the free edge of the ventral arm plate. In addition to these, admittedly subjective, characters, both *Amphiodia atra* and *Amphipholis gracillima* have perforated arm ossicles, a feature which is shared by neither *Amphiodia pulchella* (Lyman), the type-species of *Amphiodia*, nor *Amphipholis januarii*, the type-species of *Amphipholis*.

Further studies of the genus *Amphipholis* have revealed other species

which are closely related to *Amphiodia atra* and *Amphipholis gracillima*. *Amphipholis subtilis* from Brazil is certainly congeneric with *A. gracillima*, as are three nominal species of western American *Amphipholis*, *A. platydisca* Nielsen, *A. geminata* (Le Conte), and *A. puntarenae* (Lütken) (all illustrated by Nielsen, 1932). Not only do these species resemble one another externally, they all have perforated arm ossicles (Clark, in Parslow & Clark [1963] has pointed out the similarity between *Amphiodia atra* and *Amphipholis platydisca*). On the basis of internal as well as external characters then, *Amphipholis gracillima*, *A. subtilis*, *A. platydisca*, *A. geminata*, *A. puntarenae*, and *Amphiodia atra* form a closely related, congeneric assemblage.

While *Amphipholis gracillima* and its five nominal congeners form a closeknit group, this group does not appear to be congeneric with *A. januarii*, the type of *Amphipholis*. Perforated ossicles, which appear in the *A. gracillima* group, are absent in *A. januarii*. In addition, the qualitative characters of the *A. gracillima* group, such as slender, pointed arm spines, small infradental papillae, and flat, distally narrowed ventral arm plates, are not found in *A. januarii*.

Amphipholis squamata and *A. pentacantha* (H. L. Clark) also must be removed from the genus *Amphipholis* which, in the western Atlantic, is reduced to a single species, *Amphipholis januarii*. Although *A. squamata* has long been considered a typical *Amphipholis*, it certainly is not. In addition to the short arms and well developed primitive plates (which suggest a neotenic condition), the oral plates are unlike those of *Amphipholis*, but similar to those of *Amphilepis* (text references to the structure and anatomy of the oral plates refer to Murakami, 1963, or to the author's unpublished work). The arm ossicles are imperforate. *Amphipholis pentacantha* is similar to *Amphigyptis perplexa* Nielsen (1932: 306) which Nielsen considered a hemieuryalid. *Amphipholis sobrina* Matsumoto and *A. japonica* Matsumoto, discussed in detail by Murakami (1963: 19), also are very closely related to *A. squamata*; they have been included below although they are not part of the tropical American fauna. Several other species described as closely related to *A. squamata* have been synonymized with that species by Mortensen; they are also treated below.

Fell (1962: 12, 13) divides *Amphipholis* into three genera: *Amphipholis*, (restricted, *sensu* Fell); *Nullopholis*, containing species with no tentacle scales; and *Monopholis*, containing those species with only a single tentacle scale. He includes *A. pentacantha* in *Nullopholis* even though that species has tentacle scales on the basal arm segments; however, *A. pentacantha* is not similar to *A. nudipora* Koehler, the type-species of *Nullopholis*, nor does it appear closely related to *Amphiura vitax* Koehler, the type-species of Fell's genus *Monopholis*. *Amphipholis*, as restricted by

Fell, contains a polygeneric assemblage including at least three groups of species worthy of generic rank; the group comprising *A. gracillima*, *A. subtilis*, *A. platydisca*, *A. atra*, *A. puntarenae*, and *A. geminata*; the group comprising *A. squamata*, *A. japonica*, *A. patagonica* (= *A. squamata*?), *A. sobrina*, *A. pentacantha*, and perhaps *A. torelli*; and a third division consisting of *A. januarii*, and whatever congeners it may have. Although line drawings of some of the remaining species of *Amphipholis* (*sensu* Fell) are available (A. M. Clark, 1955), it is impossible to assign the species to any of the above categories on the basis of drawings alone. Further studies of *Amphiodia* and *Amphipholis* will probably reveal many species which belong in either the *A. gracillima* or the *A. januarii* group.

Family Amphiuridae

Amphipholis Ljungman, 1867 (restricted herein)

Amphipholis Ljungman, 1867: 165.

Diagnosis.—(A restricted diagnosis based on *A. januarii*.) Three oral papillae of which the distalmost is largest; oral papillae tend to be imperfectly opercular, partly closing off the oral slit; tentacle scales two; arm spines four, spine next to distalmost flattened, dorsal and ventral arm plates in overlapping rows; arm ossicles not perforated except those near distal tip of arm; abradial wing of oral plate well developed; disc covered with prominent scales.

Type Species.—*Amphipholis januarii* Ljungman, 1867a (*non Ophiolepis gracillima* Stimpson, 1852) (type by monotypy).

Discussion.—*Amphipholis* must be considered monotypic in the tropical western Atlantic. A revision of the entire *Amphipholis* complex is impossible at this time, but it would appear that few of the species formerly relegated to *Amphipholis* are actually congeneric with *A. januarii*.

Micropholis, n.g.

Diagnosis.—Three oral papillae of which the distalmost is largest; oral papillae imperfectly opercular, partly closing off the oral slit; middle oral papillae often partly overlapping the infradental papillae; tentacle scales two, the one attached to the ventral arm plate rather wide; each ventral arm plate widest proximally, longer than wide; dorsal and ventral arm plates form overlapping series; arm spines three to five, slender, pointed; arm ossicles perforated; abradial wing of oral plate well developed; disc covered by small scales of which the ventralmost may be minute.

Type Species.—*Ophiolepis atra* Stimpson, 1852 (see Thomas [1963] for synonymy and illustration).

Gender.—Feminine.

Etymology.—The generic name refers to the small scales covering the disc.

Discussion.—*Micropholis* includes the following species which are herein listed as new combinations: *Micropholis atra* (Stimpson, 1852), *Micropholis gracillima* (Stimpson, 1852), and *Micropholis subtilis* (Ljungman, 1867b), all found in the tropical western Atlantic, and *Micropholis platydisca* (Nielsen, 1932), *Micropholis geminata* (Le Conte, 1851), and *Micropholis puntarenae* (Lütken, 1856) from the eastern Pacific. *Micropholis geminata* and *M. subtilis*, and *M. platydisca* and *M. atra* appear to be geminate pairs.

Axiognathus, n.g.

Diagnosis.—Three oral papillae of which the distalmost is largest; oral papillae either imperfectly opercular or entirely closing the oral slit; tentacle scales one or two; side arm plates very large, often meeting dorsally; arm spines three to five, slender, pointed; arm ossicles not perforated; abradial wing of oral plate poorly developed, oral plate long, depressed, not higher than long; disc scales large; radial shields wide, often joined their entire length.

Type Species.—*Asterias squamata* Delle Chiaje, 1829.

Gender.—Masculine.

Etymology.—The generic name refers to the hatchet-shaped oral plates.

Discussion.—*Amphipholis squamata* is the most widely mentioned amphipod brittlestar in scientific literature. Systematically, however, it is one of the poorest known and may indeed represent a complex of species. Murakami (1963: 25) and the author (Thomas, in preparation) have illustrated the oral plates characteristic of the species of *Axiognathus*, and future work in this genus probably will deal largely with internal characters. The species which must be placed in *Axiognathus* include the following which are given herein as new combinations: *Axiognathus squamatus* (Delle Chiaje, 1829), *Axiognathus pentacanthus* (H. L. Clark, 1915), *Axiognathus japonicus* (Matsumoto, 1915), and *Axiognathus sobrinus* (Matsumoto, 1917). *Axiognathus pentacanthus* is less similar to *A. squamatus* than are the other species in the genus, but the arrangement of the external plates and the characteristic oral plates indicate that it is related to the type-species of the genus. *Amphipholis torelli* Ljungman, 1871, and *Amphigyptis perplexa* Nielsen, 1932 (which was described as a hemieuryalid) may also belong in *Axiognathus*. *Amphipholis tenuispina* Ljungman, 1864, is apparently a synonym of *Axiognathus squamatus* (see Mortensen, 1927: 221). Mortensen (1936: 292) also treated *Amphi-*

pholis patagonica (Ljungman, 1871) as a synonym of *Axiognathus squamatus*. If these two species should prove to be valid they would almost certainly fall into the genus *Axiognathus*.

SUMARIO

UNA REVISION DE LA ESPECIE TROPICAL AMERICANA DE *Amphipholis* (ECHINODERMATA: OPHIUROIDEA)

En aguas tropicales americanas, el género *Amphipholis* de estrellas frágiles anfiúridas está reducido a una sólo especie, *A. januarii* Ljungman, 1867. *Amphipholis atra* (Stimpson, 1852), *A. gracillima* (Stimpson, 1852), *A. subtilis* Ljungman, 1867a, *A. platydisca* Nielsen, 1932, *A. geminata* (Le Conte, 1851) y *A. puntarenae* (Lutken, 1956), son colocadas en el nuevo género *Micropholis*; y *A. squamata* (Delle Chiaje, 1829), *A. pentacanthus* H. L. Clark, 1915 y las especies japonesas, *A. japonicus* Matsumoto, 1915 y *A. sobrinus* Matsumoto, 1917 son colocadas en el nuevo género *Axiognathus*. Se dan discusiones de cada género y también razones para rechazar las restricciones de *Amphipholis* hechas por Fell (1962).

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